DESCRIPTION

SYNTHETIC RESIN CAP, CLOSING DEVICE, AND CONTAINER-FILLED BEVERAGE

TECHNICAL FIELD

This invention relates to a synthetic resin cap that is attached to a container opening and seals the container opening, a closing device using the synthetic resin cap, and a container-filled beverage.

BACKGROUND ART OF THE INVENTION

A linerless cap, which gives a seal function to a cap body, is one type of a synthetic resin cap.

A cap including on its top plate an inner seal projection that fits into the container opening is used as this type of linerless cap.

In conventional synthetic resin caps there is a problem in that, at the time of attaching to the container opening, the hermeticity deteriorates when the winding tightness is insufficient, and the disconnecting torque becomes too great when the winding tightness is excessive.

For this reason, there is a demand for a technique for reliably obtaining the appropriate hermeticity and disconnecting torque.

DISCLOSURE OF INVENTION

The present invention has been realized in view of the circumstances described above, and aims to provide a synthetic resin cap that may reliably obtain the appropriate hermeticity and disconnecting torque.

The synthetic resin cap of this invention is characterized in that a circular opening edge seal projection that contacts an opening edge of a container opening is provided on the inner face of a top plate, and, at the time of attaching the synthetic resin cap to the container opening, the opening edge seal projection is made able to bend and be deformed in the expanding radial direction until it contacts a cap body; a positioning protrusion is provided on the top plate, and contacts the opening edge when the opening edge seal projection has bend and deformed until contacting the cap body.

The positioning protrusion may preferably be integrated with the inner seal projection.

The opening seal projection may be constituted from an erect cylindrical section extending downward from the top plate, and an expanding cylindrical section spreads in a skirt-like shape from the erect cylindrical section.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a partial cross-sectional view showing an embodiment of a closing device according to this invention.

FIG. 2 is an enlarged cross-sectional view showing part of the synthetic resin cap shown in FIG. 1.

FIG. 3 is a step diagram showing a step of attaching the synthetic resin cap shown in FIG. 1 to a container opening.

FIG. 4 is a step diagram showing a state in which the synthetic resin cap of FIG. 1 is attached to the container opening.

BEST MODE FOR CARRYING OUT THE INVENTION

FIG. 1 and FIG. 2 show an embodiment of a closing device of this invention, the closing device shown here including a container 21, and a synthetic resin cap 1 that is attached to an opening 20 of the container 21.

The container 21 is made of a synthetic resin such as polyethylene terephthalate (PET), glass, or the like, a threaded section 22 that is formed around the outer periphery of the container opening 20, and an expanding step section 23 that is formed below the threaded section 22. An opening edge 20b of the container opening 20 is provided flatly so as to run along a substantially horizontal face.

The synthetic resin cap 1 includes a cap body 4 having the disk-shaped top plate 2 and a cylindrical section 3 extending downward from the periphery of the top plate2, a circular inner seal projection 12 which fits into the container opening 20 projecting downward provided on an inner surface of the top plate 2, and a circular opening edge seal projection 13, which contacts the opening edge 20b (particularly outer peripheral section 20c thereof) of the container opening 20 projecting downward provided on an inner surface of the top plate 2.

The cylindrical section 3 of the cap body 4 is divided by a horizontal score 6 (weakening line) into a main section 8 above the horizontal score 6, and a tamper evidence ring section 9 (TE ring section), which is connected to the bottom edge of the main section 8 by bridges 7.

A threaded section 10 engaging with the threaded section 22 of the container opening 20 is formed on the inner face of the main section 8.

Tabs 11 are provided on the inner face of the TE ring section 9. Tabs 11 are a plurality of thin plate-like clipping means for preventing the movement of the TE ring section 9 by clipping with the container 21 when the cap 1 is disconnected.

The cap 1 is made of a synthetic resin material such as high density

polyethylene or polypropylene.

The inner seal projection 12 contacts an inner peripheral surface 20a of the container opening 20 when fitted into the container opening 20.

Preferably, the inner seal projection 12 may gradually increase in diameter as it extends downward, so that the outer diameter of a maximum outer diameter section 12a is greater than the inner diameter of the container opening 20.

The inner seal projection 12 may preferably be formed so that it may elastically deformable in the compressing radial direction so as to be fitted into the container opening 20.

That is, as shown by the alternate long and short dash line in FIG. 2, the inner seal projection 12 may be constituted so that it may elastically bend and deform in the compressing radial direction (the direction in which a tip 12c moves inward) at a base section 12b.

The protruding length of the inner seal projection 12 is preferably from 1 to 5 mm (more preferably from 2 to 4 mm).

The thickness of the inner seal projection 12 is preferably from 0.5 to 2 mm (more preferably from 0.5 to 1 mm).

The gradient angle of the outer surface of the inner seal projection 12 with respect to the vertical direction (the direction perpendicular to the top plate 2) is preferably from 5° to 30° (more preferably from 10° to 20°).

The height position of the maximum outer diameter section 12a is preferably set so that the distance between the maximum outer diameter section 12a and the top plate 2 is 4 mm or less (more preferably 3 mm or less).

The outer diameter of the maximum outer diameter section 12a is preferably from 21.74 mm to 23.74 mm (more preferably from 21.94 mm to 22.94 mm).

The difference between the outer diameter of the maximum outer diameter section 12a and the inner diameter of the container opening 20 is preferably 1 mm or less (more preferably from 0.1 mm to 0.6 mm).

The opening edge seal projection 13 sealing the opening edge 20b of the container opening 20 (particularly the outer peripheral section 20c) is formed on the outer side of the diameter direction than the inner seal projection 12. The opening edge seal projection 13 has an erect cylindrical section 13a extending substantially vertically downward from the inner face of the top plate 2, and a skirt-like expanding cylindrical section 13b widening in diameter along with extending downward from the bottom edge of the erect cylindrical section 13a.

The projection length of the opening edge seal projection 13 is preferably from 1 mm to 4 mm (more preferably from 1.5 mm to 3 mm).

The length of the erect cylindrical section 13a is preferably from 0.5 mm to 3 mm (more preferably from 1 mm to 2 mm), and thickness thereof is preferably from 0.1 mm to 1 mm (more preferably from 0.2 mm to 0.5 mm).

The length of the expanding cylindrical section 13b is preferably from 0.5 mm to 3 mm (more preferably from 1 mm to 2 mm), and thickness thereof is preferably set greater than the thickness of the erect cylindrical section 13a, more specifically, from 0.2 mm to 1.5 mm (more preferably from 0.4 mm to 1 mm).

The gradient angle of the expanding cylindrical section 13b with respect to the vertical direction is preferably from 20° to 60°.

The opening edge seal projection 13 is capable of bending and deforming in the expanding radial direction at a base section 13c of the erect cylindrical section 13a.

The inner diameter of the erect cylindrical section 13a is set smaller than the

outer diameter of the container opening 20.

The diameter of a bottom edge 13d of the expanding cylindrical section 13b is preferably set larger than the outer diameter of the container opening 20.

A thin section 2b is thinner than the outer periphery section 2a, and is formed in the central section of the top plate 2. The thin section 2b is provided inner than the base section 12b of the inner seal projection 12. The thin section 2b is preferably circular in shape.

The thickness of the thin section 2b is preferably from 0.5 mm to 2.0 mm (more preferably from 1.0 mm to 1.5 mm).

The height of a step 2c between the outer periphery section 2a and the thin section 2b is preferably from 0.1 mm to 1.0 (more preferably from 0.2 mm to 0.8 mm).

An auxiliary wall section 14 is provided at a corner 15 on the inner surface of the connecting section between the top plate 2 and the cylindrical section 3, and tapers from top to bottom so as to fill up the corner 15.

Since the auxiliary wall section 14 increases the rigidity of the connecting section between the top plate 2 and the cylindrical section 3, preventing the top plate 2 from expanding and deforming when the pressure inside the container 21 is increased, the height and width of the auxiliary wall section 14 is preferably between 0.2 mm and 2 mm (more preferably between 0.5 mm and 1.8 mm).

The auxiliary wall section 14 is made of the same material as the cap body 4, and is preferably integrated with the cap body 4.

In the cap 1 of this embodiment, a positioning protrusion 16 contacting the opening edge 20b of the container opening 20 is provided on the top plate 2.

The positioning protrusion 16 is substantially rectangular in cross-section and

protrudes downward in order to keep the distance between the top plate 2 and the opening edge 20b substantially constant and to keep the wind tightening angle substantially constant when attaching the cap.

The positioning protrusion 16 is integrated with the inner seal projection 12 on the outer surface side of the inner seal projection.

The positioning protrusion 16 is provided at a position so that bottom face 16a thereof contacts the opening edge 20b as attaching the cap 1 to the container opening 20.

The positioning protrusion 16 may be formed in a continuous circular shape in the circumferential direction, or in a non-continuous circular shape including a plurality of island-like projections that are arranged in the circumferential direction.

The height A of the positioning protrusion 16 is preferably from 0.2 mm to 1.5 mm (more preferably from 0.5 mm to 1 mm).

When the height A is shorter than this range, the disconnecting torque is liable to become excessive; when the height A is higher than this range, the hermeticity is liable to decrease.

The width B of the positioning protrusion 16 is preferably from 0.5 mm to 1.5 mm (more preferably from 0.7 mm to 1.3 mm).

Subsequently, the operation of the cap 1 when it is attached to the container opening 20 will be explained with reference to FIGS. 3 and 4.

When the cap 1 is wound and tightened around the container opening 20, the inner seal projection 12 fits into the container opening 20 and contacts the inner peripheral surface 20a of the container opening 20 with no gap therebetween.

When the inner seal projection 12 fits into the container opening 20, the inner seal projection 12 elastically bends and deforms at the base section 12b in the

compressing radial direction (the direction in which the tip 12c moves inward) (see FIG. 3).

As a consequence, the outer diameter of the inner seal projection 12 decreases, enabling it to fit into the container opening 20.

After having been fitted into the container opening 20, the inner seal projection 12 has elastically deformed in the compressing radial direction, whereby its elastic restoring force applies a pressing force to the container opening 20 in the expanding radial direction.

As the cap 1 is rotated, the outer peripheral section 20c of the opening edge 20b of the container opening 20 contacts the inner surface of the expanding cylindrical section 13b of the opening edge seal projection 13, applying an upward force against it (see FIG. 3).

As a result of the application of the upward force of the container opening 20 against the expanding cylindrical section 13b, a force in the expanding radial direction is applied against the opening edge seal projection 13, whereby the opening edge seal projection 13 bends and deforms at the base 13c in the expanding radial direction, and its tip side moves outward.

As shown in FIG. 4, when the cap 1 is further rotated, the container opening 20 causes the opening edge seal projection 13 to bend and deform further in the expanding radial direction, and a tip 13e contacts the cap body 4 (the auxiliary wall section 14 in the example shown in FIG. 4).

In this state, the outer peripheral section 20c of the opening edge 20b applies a diagonally upward pressing force against the erect cylindrical section 13a, and in addition, the auxiliary wall section 14 applies a diagonally downward resistant force against the expanding cylindrical section 13b, whereby the opening edge seal

projection 13 slightly bends and deforms in the midsection of longitudinal direction so as to jut outward.

Consequently, the opening edge seal projection 13 bends and deforms outwardly at the base section 13c and bends and deforms outwardly also at the midsection of the longitudinal direction.

Therefore, the elastic restoring force pushes the opening edge seal projection 13 against the opening edge 20b (particularly the outer peripheral section 20c) so that the opening edge seal projection 13 contacts the opening edge 20b (particularly the outer peripheral section 20c) without a gap, thereby sealing the container opening 20.

At this time, since the opening edge seal projection 13 does not contact the entire opening edge 20b but only a narrow area including the outer peripheral section 20c, the force applied against the opening edge 20b by the opening edge seal projection 13 is concentrated near the outer peripheral section 20c.

In the state shown in FIG. 4, the opening edge 20b of the container opening 20 is contacting the bottom surface 16a of the positioning protrusion 16.

This positions the height of the cap 1 with respect to the opening edge 20b, and obtains a predetermined distance between the top plate 2 and the opening edge 20b.

Consequently, the deformation amount of the opening edge seal projection 13 reaches a predetermined value, and the pressing force of the opening edge seal projection 13 against the opening edge 20b reaches a predetermined value.

By attaching the cap 1 to the container opening 20 by the steps described above, the container 21 is hermetically sealed.

When the cap 1, which has been attached to the container opening 20, is rotated in the disconnecting direction, the tabs 11 that are provided on the inner

surface of the TE ring section 9 clip with the bottom edge of the expanding step section 23 of the container opening 20, making the main section 8 of the cap body 4 rise as the cap 1 is rotated and stopping the TE ring section 9 from moving upward.

Consequently, an expanding force acts on the plurality of narrow bridges 7 that are connecting the cap main section 8 to the TE ring section 9, breaking the bridges 7, cutting away the TE ring section 9 from the main section 8, and disconnecting the cap 1.

In the cap 1 of this embodiment, since the positioning protrusion 16 is provided on the top plate 2 and contacts the opening edge 20b when the opening edge seal projection 13 has bent and deformed until contacting the cap body 4, at the time of attaching the cap, a predetermined distance between the top plate 2 and the opening edge 20b can be ensured, and the pressing force of the opening edge seal projection 13 against the opening edge 20b can be made sufficient.

Therefore, sufficient sealing capability can be achieved.

Furthermore, since a predetermined distance can be obtained between the top plate 2 and the opening edge 20b, a predetermined wind tightening angle can be ensured when attaching the cap.

Therefore, the disconnecting torque can be set to an appropriate value.

Incidentally, the clipping means of the tamper evidence ring section 9 are not limited to the tabs 11 in the embodiment described above, it being acceptable to use tabs including wings and beads, as disclosed in Japanese Patent Application No. H08-46445 already applied for by the present applicant, or clipping means that combine clipping claws on the container side and clipping protrusions on the tamper evidence ring side, as disclosed in Japanese Patent Applications Nos. H06-228514, H06-246619, H06-275415, H06-307804, H06-313837, H07-84315, and H07-109850.

In this invention, the container 21 may be filled with a beverage such as fruit juice, tea, coffee, and the like, so that by attaching the cap 1 to the container opening 20 it is possible to obtain a container-filled beverage.

INDUSTRIAL APPLICABILITY

As described above, the synthetic resin cap of this invention has the positioning protrusion contacting the opening edge on the top plate, so that at the time of attaching the cap, a predetermined distance may be obtained between the top plate and the opening edge, and a predetermined pressing force may be applied against the opening edge by the opening edge seal projection, obtaining sufficient sealing capability.

Furthermore, since a predetermined distance can be obtained between the top plate and the opening edge, the wind tightening angle when attaching the cap can be set at a predetermined value, and the disconnecting torque can be set to an appropriate value.